WORK PLAN

SUPPLEMENTAL PILOT STUDY DNAPL RECOVERY SYSTEM

DETREX FACILITY ASHTABULA, OH

Prepared for
Detrex Corporation
Ashtabula, OH

December 2004

URS

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Project No. 13810246.00000

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This Supplemental Pilot Study Work Plan has been prepared in response to an October 12, 2004 Comment Letter from USEPA concerning operation and maintenance (O&M) issues encountered during operation of the dense non-aqueous phase liquid (DNAPL) pilot recovery system installed at the Detrex Facility, Ashtabula, Ohio. USEPA provided Detrex with comments on Detrex proposal to test an alternative well design. Detrex proposed the installation of two "experimental" wells to evaluate potential alternative designs in response to the operation and maintenance issues that had been identified with the DNAPL recovery system.

This pilot study proposes an alternative well design to address issues with silt build-up and DNAPL crystallization in the recovery wells and an alternative pump to address issues with short-circuiting experienced with the current pump. A copy of the October 12, 2004 comment letter, as well as the November 12, 2004 Detrex response to USEPA concerns, is provided in Appendix A of this Work Plan. This Work Plan addresses USEPA Comment 1 through Comment 7. USEPA Comment 8 was addressed in a separate submittal provided to USEPA by Detrex on December 12, 2004. A copy of the December 12, 2004 submittal, which consists of revised pages for insertion into the system O&M plan, is provided in Appendix B.

1.1 BACKGROUND

Detrex Corporation (Detrex) operates a facility at 1100 North State Road in Ashtabula, Ohio. The general location of the Detrex Facility is provided in Figure 1-1. On February 26, 1998, the United States Environmental Protection Agency (U.S. EPA) issued a *Unilateral Administrative Order* (UAO) and a *Scope of Work for Remedial Design and Remedial Action for the Detrex Source Area* (the UAO SOW) requiring that Detrex develop plans and specifications for remedial measures at the facility.

Phase I Remedial Investigation/Feasibility Study (RI/FS) Source Control environmental assessment investigations identified an area in the northeast corner of the Detrex Facility where soil and groundwater have been impacted by chlorinated volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Soil borings and monitoring wells in this area have also identified a dense, non-aqueous phase liquid (DNAPL) layer that contains these VOCs and SVOCs. The area was formerly occupied by a series of settling ponds that were taken out of service and backfilled with soil. The former ponds were associated with manufacturing operations that have been discontinued at this facility.

Technical Memorandum 3 (W-C, May 1997) included a feasibility study that identified several conceptual remedial alternatives for the Detrex site. The U.S. EPA selected Alternative No. IV in the Source Control Record of Decision (ROD) issued September 1, 1997, to address the environmental conditions identified at the facility and prevent recontamination of sediment within Fields Brook. Alternative No. IV included:

- A downgradient vertical barrier wall (slurry wall);
- A groundwater collection trench upgradient of the slurry wall;
- A groundwater collection trench beneath the DS Tributary;
- Removal of sediments from the northern drainage ditch;

- Regrading activities in the northeastern portion of the property;
- Removal of the catalyst pile materials; and,
- Installation of a DNAPL recovery system.

Each of the action items, with the exception of the DNAPL recovery system, was addressed in the *Plans and Specifications for Remedial Design/Remedial Action* dated February 17, 2000. A *Remedial Action Work Plan* for those activities was issued on August 28, 2000 and work was initiated in September 2000. The slurry wall, collection trenches, sediment excavation, site grading and catalyst pile removal were completed in March 2001.

The *Plans and Specifications for DNAPL Recovery System* was issued at the 100 percent level on April 13, 2001. As agreed with USEPA, 12 of the 36 proposed recovery wells were installed in order to evaluate the DNAPL recovery system design as a pilot study prior to full-scale implementation. Construction of the pilot DNAPL recovery system was completed in October 2002.

1.2 OBJECTIVE OF THE SUPPLEMENTAL PILOT STUDY

The objective of the supplemental pilot study is to evaluate alternative recovery well and pumping system designs that minimize or eliminate the operation and maintenance issues associated with the existing pilot study design, which are described in Section 2.1 of the Work Plan. In order to meet this objective, the Work Plan provides the following information:

- Overview of existing DNAPL recovery system,
- Overview of maintenance issues with existing system,
- Detailed description of proposed experimental well design, and
- Evaluation of potential alternative pumping options.

An overview of the existing DNAPL Recovery system, including O&M issues, is provided in the following sections.

2.1 OVERVIEW OF EXISTING DNAPL RECOVERY PILOT STUDY

The pilot DNAPL recovery system consists of a performance-scale, vacuum-enhanced DNAPL recovery system installed to remove readily recoverable DNAPL from the subsurface. Twelve recovery wells were installed as a part of the pilot study. The DNAPL poses recontamination concerns to sediments and surface water in the DS Tributary. The location of the DS tributary is provided in Figure 1-2. The performance-scale operation was proposed for a 1 to 2-year time period to optimize the design of the full-scale system. The full-scale system was designed with 24 additional recovery wells and may differ in its design, depending on results of the pilot study. The additional 24 recovery wells would make a total of 36 recovery wells for the full-scale system.

The system is designed to operate continuously, although all components of the system may not operate at a given time. Key design considerations include the density of the DNAPL (specific gravity~1.5), the low permeability of the subsurface materials, and the incompatibility of the DNAPL constituents with certain common construction materials, such as poly vinyl chloride (PVC).

Work activities for the Remedial Action for the completion of the *DNAPL Recovery System* included the following:

- DNAPL Recovery Well Drilling and Installation – Completion of 12, stainless steel, Phase I DNAPL recovery well installations along the northern border of Detrex property, and running north-south from the northern boundary of Detrex property.
- DNAPL System Monitoring Wells – Completion of 3, stainless steel, Phase I DNAPL monitoring wells in the vicinity of the recovery wells for monitoring of groundwater levels and DNAPL thickness.
- Equipment Building Installation – Installation of the equipment building, including but not limited to the foundation and floor slab, all specified plumbing, pumping stations, valves and manifolds, blowers, filters, DNAPL/Water separator, DNAPL holding tank, and granular activated carbon treatment vessels.
- Satellite Pump House Installation – Installation of 2 satellite pump houses, including but not limited to, all specified plumbing, pumps, valves and manifolds.
- Plumbing and Hardware Connections – Installation of piping, braces and supports to connect the system together as shown in the attached design drawings, and as described in this document, any addenda, or written and approved changes or modifications.
- Power Supply – Installation of a power supply adequate to operate and maintain all components of the system.
- Logic Controllers – Installation of programmable logic controllers for the operation

of the remediation system components.

A total of 4,585 gallons of DNAPL was recovered in the first year of operation of the pilot DNAPL recovery system.

2.2 OVERVIEW OF OPERATION AND MAINTENANCE ISSUES

Since installation of the pilot DNAPL recovery system was completed in October 2002, a significant quantity of DNAPL has been recovered. However, not all system components are functioning as anticipated, resulting in a high level of maintenance. Between October 2002 and September 2003, four wells were capped and taken off-line due to short-circuiting of injected air (RW-2 and RW-11) or excessive sediment production (RW-4 and RW-10).

During Fall 2003 and Winter 2004, Detrex made several improvements to the treatment system, including the following:

- Installation of a 500 to 600-gallon vertical stainless steel settling tank with a rounded base to receive the system influent in the treatment building. The existing DNAPL/water separator was removed.
- Replacement of the existing pump houses with 8'x 8' x 8' wood-framed buildings with heating, insulation, lighting and ventilation. The existing recovery pumps and vacuum boxes were re-used, and the manifolds were rebuilt and equipped with pneumatically actuated solenoid valves.
- Replacement of existing HDPE piping (tubing) with stainless steel piping due to sagging between supports and concerns that low spots may freeze. Detrex also replaced the HDPE drop tubes with stainless steel drop tubes.
- Redevelopment of all recovery wells using a rotary screw pump equipped with a foot-valve.
- Installation of sleeves in two existing wells to assess the effectiveness of reducing available screen length in reducing short-circuiting.

Although the screens and casing of all recovery wells remain intact, select wells remain off-line due to short-circuiting or excessive silt production or DNAPL crystallization, despite the system improvements. In addition, it is anticipated that the wells will likely require increased pressure over time to pump DNAPL, which will further exacerbate problems with short-circuiting. Based on a review of operational data as well as the ongoing maintenance issues with silt production, DNAPL crystallization and short-circuiting, the following changes to the existing well design and pumping system are recommended:

- To reduce or eliminate excess silt build-up including DNAPL crystals in the well, the borehole diameter will be increased to approximately 12-inches and the screen size will be decreased from 0.020 to 0.010 inches. In addition, the sand grain size will be reduced to allow less than 5% of the sand pack to pass through the screen.
- To avoid short-circuiting, the pumping system design will be modified to eliminate the introduction of air into the recovery well screen.

The proposed recovery well design, as well as an evaluation of available pump alternatives, is provided in the following sections.

3.1 OBJECTIVE

The objective of the revised extraction well installation is to provide a well design that will not be subject to the maintenance problems identified in the current pilot study, such as silting and DNAPL crystallization.

3.2 OVERVIEW OF EXTRACTION WELL DESIGN

The intent of the extraction well design is to limit the amount of silt and crystallized DNAPL entering the wells by increasing the volume of the filter pack and reducing the size of the well screen slots. The existing wells are constructed with 0.020-inch slotted screens installed in boreholes made with a 4.25-inch auger.

The proposed extraction wells will be installed in 12-inch diameter boreholes. The boreholes will be advanced using Rotosonic drilling techniques. Rotosonic drilling uses a combination of rotary motion and oscillation. During this process, the drill bit is vibrated up and down while also being pushed down and rotated. This creates a high frequency force that in overburden causes the soil particles to fluidize. Spoils are removed using water or compressed air. The primary advantage of the rotosonic technique is reduction of smearing of the subsurface as the borehole is completed and the reduction in the volume of spoils created.

At a minimum, borings will extend to the contact between the lacustrine sediments and glacial till soils, which are expected to be encountered at 20 to 25 feet below the ground surface based on existing recovery wells. The actual depth will be determined in the field base on conditions encountered. Boring logs will be prepared for each location and will include the following information:

- A description of geologic materials and the depth at which encountered;
- Static water level;
- Boring termination depth;
- A description of problems and corrective measures; and
- The depth and diameter of the temporary casing.

Well casing materials will be 2.0-inch diameter, Schedule 5 flush threaded stainless steel pipe. Well screens will be 2.0-inch diameter slotted stainless steel with 0.010-inch slots. Screen length will vary from 2 to 5 feet. The actual screen length will be determined based on field conditions and adjusted so the top of the screens in both wells are at the same approximate elevations to prevent short circuiting. The filter pack will consist of poorly graded fine (USCS) sand with less than 5 percent passing a #8 standard sieve opening. The filter pack will extend 2 to 4 feet above the top of the screen. Proposed well construction details are shown in Figure 3-1.

3.3 PROPOSED EXTRACTION WELL LOCATIONS

In order to evaluate the effectiveness of the proposed extraction well design, the two wells will be installed in the general vicinity of existing wells where the greatest amount of silting has been observed. The proposed well locations are shown on Figure 3-2. Exact locations will be determined based on field conditions. The intent is to locate one well within 10 to 15 feet of existing well RW-04 and one well within 10 to 15 feet of RW-10. These wells are currently non-operational due to silting problems. Therefore, this area represents "worst-case" site conditions that have lead to the current maintenance problems. Discharge lines from the wells will be tied into the existing pump houses.

The existing DNAPL recovery pilot system located at the Detrex facility has shown it is capable of recovering DNAPL, despite the presence of silt and crystallized products. However, as previously described, there have been numerous operation and maintenance issues associated with the pumps, including short-circuiting of the injected air supply leading to potential VOC emissions to the atmosphere, as well as the heavy silt deposits and crystallized DNAPL particles interfering with pump performance. Due to these ongoing operation and maintenance issues, other pump alternatives have been evaluated to assess the potential for continuous operation with reduced maintenance requirements. An assessment of several potential pump alternatives is provided in the following sections. These pumps have been evaluated based upon their ability to pump DNAPL with silts and crystallized particles from two-inch recovery wells. Other considerations include the elimination of short-circuiting.

4.1 POTENTIAL PUMP ALTERNATIVES

The following types of pumps were identified as a possible alternative to the existing pneumatic pumps currently installed:

- Positive Displacement Piston Pumps
- Bladderless Air Displacement Pumps
- Pneumatic Bladder Pumps
- Pneumatic Skimmer Pumps
- Air Lift Pumps

The objective of the evaluation of alternative pumps is to identify a pump capable of pumping DNAPL that has significant silting, as well as crystallized DNAPL particles and eliminated short-circuiting.

4.1.1 Positive Displacement Piston Pumps

Pneumatic or electric positive displacement piston pumps have been used to effectively recover DNAPL from the subsurface. They are able to handle viscous sticky liquids, as well as silts and crystallized products. These pumps operate much like a syringe to draw the product from the bottom of wells two (2) inches and larger at rates low enough to eliminate emulsification and pump corrosion. Positive displacement pumps are capable of pumping 0 to 10 gallons per minute.

The piston pumps have explosion-proof electric or pneumatic top head drive motors that reside outside of the recovery well. No electric wires or compressed air lines enter the well. This makes these pumps ideal for hazardous or potentially hazardous, chemically reactive or explosive applications. The surface mounted drive motor ensures that the operators minimize contact with the liquids being pumped, which ensures a safer, cleaner, and healthier working environment and a faster, easier field service response. In addition, the elimination of forced air prevents the short-circuiting that has been experienced with the Detrex DNAPL recovery system.

The piston pumps can pump hot and/or highly viscous/solid-laden liquids. Because of the positive displacement pumping action of the piston pumps, the liquid is minimally disturbed when pumped. This prevents emulsification of the DNAPL. In addition, the positive displacement pumps can pump against high head at a controlled flow rate, independent of liquid head in the well. The recovery rate can be matched with the rate of the well production and prevent premature silting and well degradation.

These pumps have individual variable speed drive motors and an individual PLC at each well location. A system of pumps can be connected into a "mother" PLC such that they can each be operated from a single location.

4.1.2 Bladderless Air Displacement Pumps

Bladderless Air Displacement Pumps (alpha pumps), are submersible pumps that can be utilized to recover DNAPL from wells two (2) inches and larger. This type of pump has been utilized for cleanup of solvents, acids, bases and corrosive chlorides. Bladderless air displacement pumps have only two moving parts, including a self-cleaning check valve. They are pneumatically operated and controlled, and are able to operate in the presence of high solids, viscous liquids, or strong chemicals. In addition, air displacement pumps with an internal float and lever to cycle on and off at predetermined set points are available.

Bladderless air displacement pumps are capable of attaining a maximum flow rate of two gallons per minute when supplied with 100 psi drive air. They have a bottom inlet capable of pumping the well almost completely dry, providing that the pumping rate is greater than the well recovery rate. In addition, they are intrinsically safe with no electrical connections at the wellhead. Controllers allow for simple flow optimization.

A major disadvantage of the bladderless air displacement pumps is that there is direct air to water contact, which may cause short-circuiting and possibly result in VOC emissions. As noted, the existing DNAPL recovery system at the Detrex facility has experienced short-circuiting due to air escaping through the unsaturated screened interval of the wells and bubbling to the surface. This could possibly result in the release of volatilized chlorinated solvents into the atmosphere. The bladderless air displacement pumping system would not likely eliminate the short-circuiting that is an issue with the existing DNAPL recovery system.

4.1.3 Pneumatic Bladder Pumps

Pneumatic bladder pumps operate on air pressure, similar the bladderless air displacement pumps, but utilize an internal bladder to isolate the pump air supply from the contaminated liquid. Since there is no air to water contact, the possibility of VOC emissions is greatly reduced. These pumps are available in bottom-inlet units for DNAPL recovery. They are powered by compressed air and typically utilize an external timer based controller to control the cycling of the bladder pump.

Compressed air is supplied to this pump via an external controller. When the bladder is squeezed from the outside by compressed air, the fluid within the bladder is forced out through a check valve at the top of the pump. When the air pressure around the bladder is exhausted, the bladder expands resuming its original shape and pulling fluids through the inlet.

The potential drawback to the pneumatic bladder pumps studied for this application (for 2" well installations) is that they only have a ½ inch discharge line, which could potentially be slowed or blocked by the heavy silt deposits and crystallized particles found in the Detrex wells, leading to increased maintenance concerns.

4.1.4 Pneumatic Skimmer Pumps

Pneumatic skimmer pumps are bladder pumps with a hydrophobic skimmer assembly attached to the bottom of the pump. The skimmer acts to separate the DNAPL from water that may be present in the well. There are different types of hydrophobic skimmers available and the selection is based on the difference in density or viscosity between the water and the DNAPL. These pumps operate similarly to the bladder pumps except that the skimmer assembly floats at the interface between the water and the DNAPL in the well. This allows for intake of DNAPL while only pumping a small amount of water.

Several issues exist with this pumping method. The pneumatic skimmer pumps have very low flow rates, which are on the order of four gallons per hour due to the hydrophobic skimmer element. Fouling of the hydrophobic skimmer element due to the heavy silts and crystallized particles is a maintenance concern. Once fouled, the pumping systems would have to be removed from the wells, resulting in operator contact with the DNAPL. Lastly, there are more "working parts" located within the wells that could potentially increase maintenance concerns.

4.1.5 Air Lift Pumps

Airlift pumps have typically been used to transfer liquids and slurries form mine shafts or draw oil from dead wells. These pumps have proven applicable in field operations, including DNAPL recovery, because they have good reliability, a low level of component maintenance and the ability to handle hazardous materials safely. They are mechanically simple and easily maintained.

Airlift pumps operate by injecting compressed air into the water within a discharge pipe, at a point below the water level in the well. The injection of the air results in a mixture of air bubbles and water, which has a lesser density than water outside the discharge pipe. This differential forces the air/water mixture up the discharge line. The two critical factors associated with this method are the submergence of the air line (i.e. the liquid head above the air line) and the size of the discharge line. The components within the well consist of an air line equipped with a foot piece at the bottom. The foot piece breaks the air into small bubbles, which assists the airlift. In addition, there is a vertical discharge pipe which carries the water/DNAPL mixture to the surface.

One of the drawbacks to the airlift pumps is that their operation is dependent upon their submergence. Therefore, they are dependent upon the liquid head in the well. For this reason, it is not possible to get complete draw down in the wells, and therefore it may not be possible to recover DNAPL from the bottom of the wells. There are also potential issues in applying the airlift technology to a two-inch diameter well.

Similar to the air displacement pumps, air lift pumps result in direct air to water contact, which may possibly result in VOC emissions. As mentioned previously, the existing pilot system at the Detrex facility has experienced short-circuiting due to air escaping through the unsaturated screened interval of the wells and bubbling to the surface. This could possibly result in the release of volatilized chlorinated solvents into the atmosphere. The airlift pumping system would not likely eliminate the short-circuiting that is an issue with the existing DNAPL recovery system..

4.2 PROPOSED SUPPLEMENTAL PILOT STUDY ALTERNATIVE PUMP

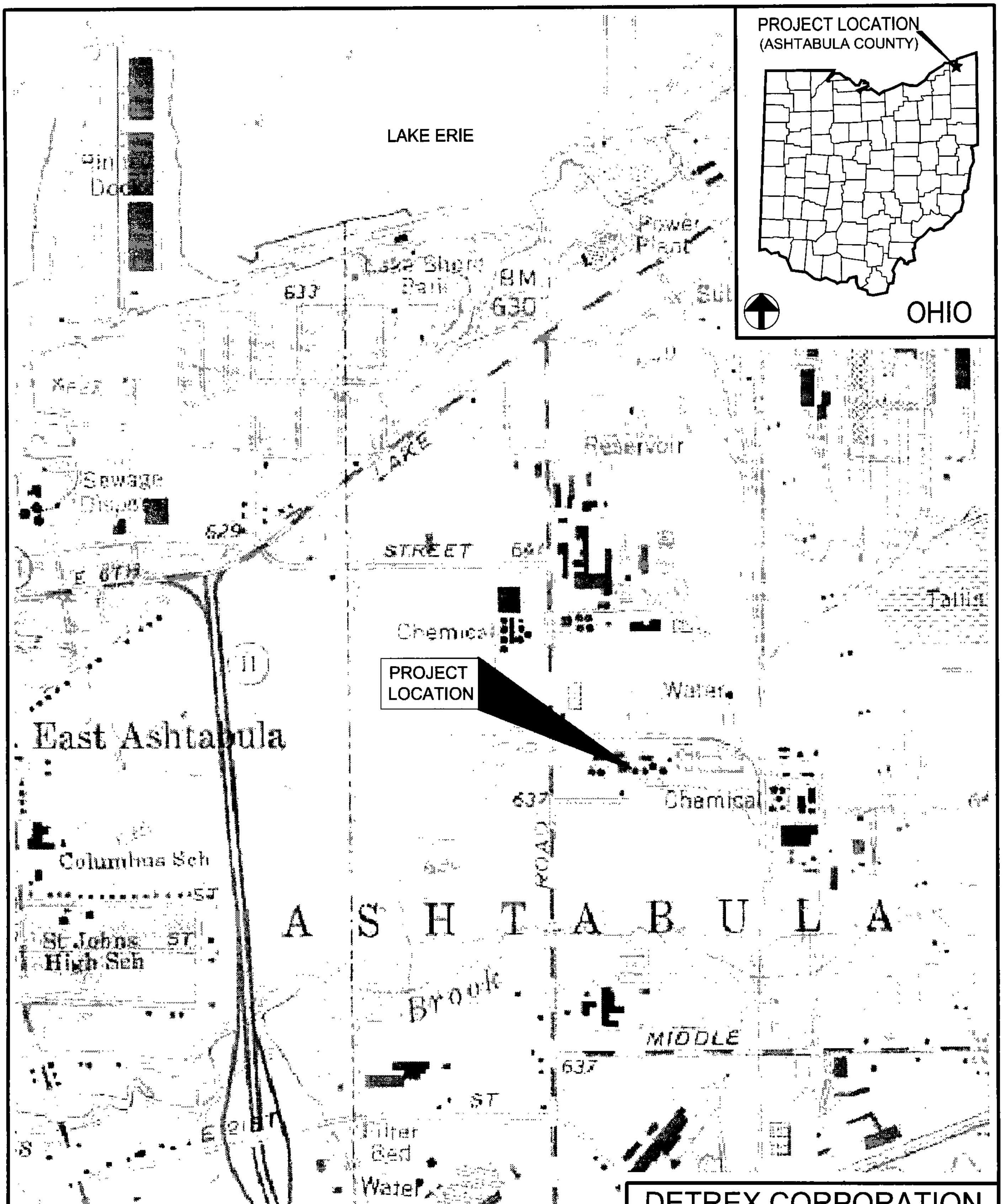
Although a significant quantity of DNAPL has been recovered by the existing pilot DNAPL recovery system at the Detrex facility, large amounts of silt and crystallized DNAPL particles have continued to be cause significant operation and maintenance issues. Due to the short-circuiting and resulting potential VOC emissions associated with the existing pilot DNAPL recovery system, any type of system that utilizes the direct injection of air into the wells should be avoided. Also, the two-inch well diameter restricted the selection of some of the conventional DNAPL pump styles that may have otherwise performed well under the existing site conditions.

URS recommends a positive displacement piston pump such as the Trident Pump Model DT01, manufactured by Blackhawk Company, for evaluation as part of the supplemental pilot study. Research has shown that these pumps are capable of effectively working under the site conditions encountered at the Detrex facility.

The Trident Pumps are pneumatically driven with a top head drive and flow range of 0 to 10 gallons per minute. They are designed for difficult, hazardous, explosive, and/or chemically challenging pumping applications. These pumps are constructed of materials capable of handling the hazardous conditions found on this site, including standard Viton seals. These pumps can operate wet or dry, independently of the liquid head. In addition, the pumping rate can be matched to the yield of DNAPL in the well. They also handle the product in a manner that minimizes emulsification. The elimination of forced air into the well should eliminate all issues with short-circuiting.

Positive displacement piston pumps, such as the Trident Pump Model DT01, are capable of handling the heavy silt deposits and crystallized DNAPL particles. This pumping system should increase the rate of DNAPL recovery while minimizing maintenance and operational requirements. Product information for the Trident Pump Model DT01 is included Appendix C of this Work Plan. The proposed pumps, in conjunction with the newly installed recovery wells, will be operated for a minimum of one year to assess performance.

FIGURES



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UNITED STATES GEOLOGICAL SURVEY
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DETREX CORPORATION

Figure 1-1
General Location Map

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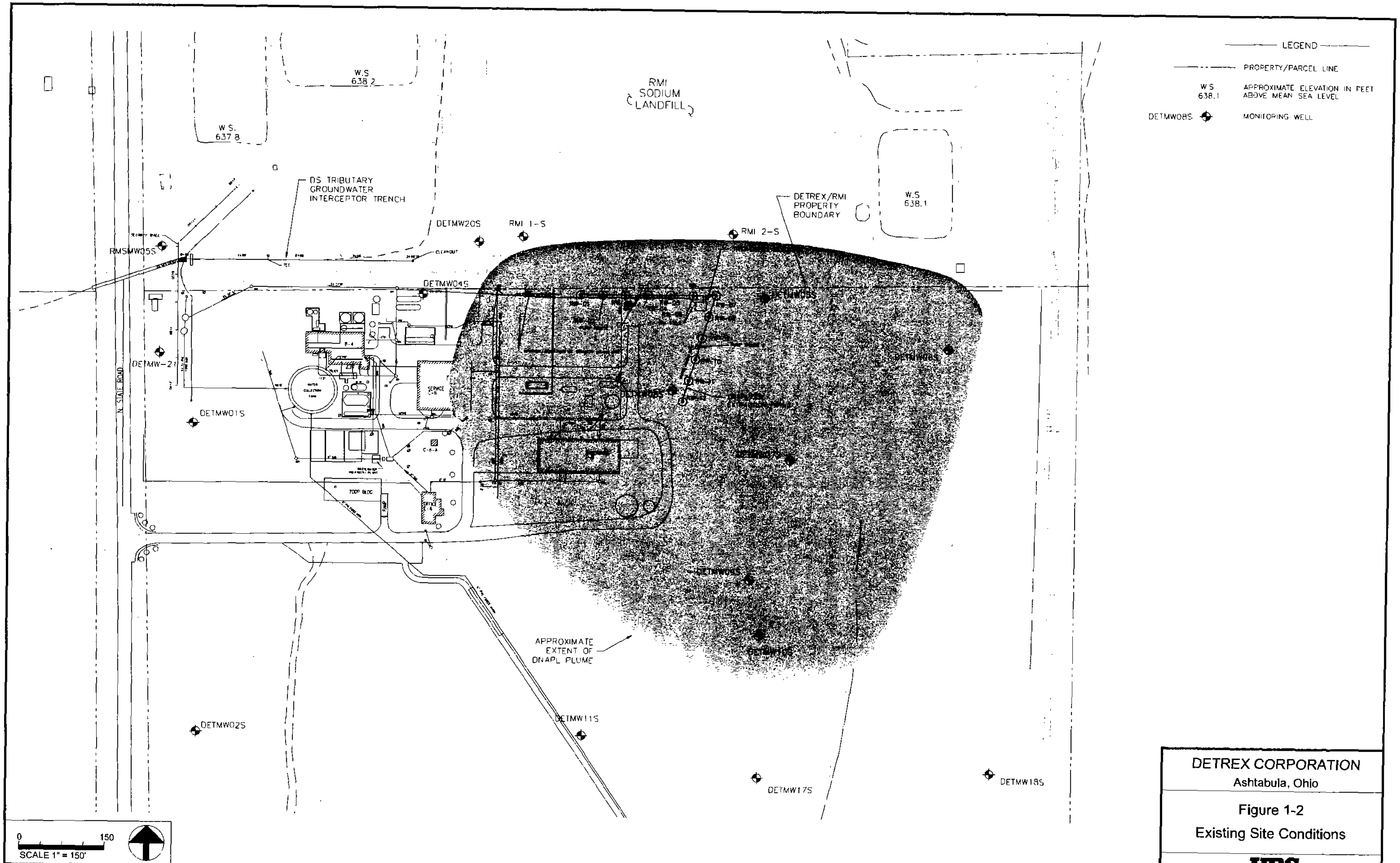

DETREX CORPORATION
Ashtabula, Ohio

Figure 1-2
Existing Site Conditions

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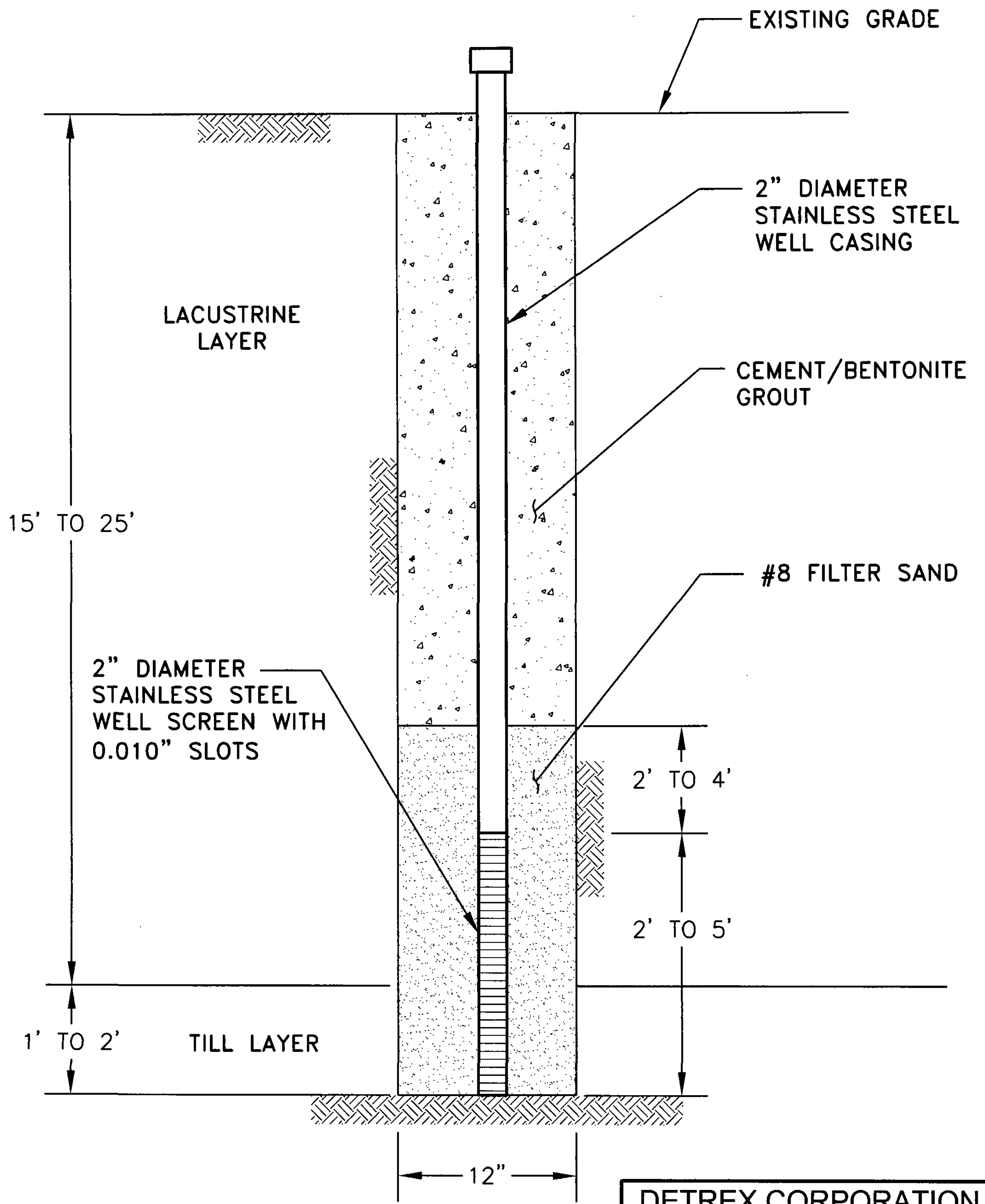

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DETREX CORPORATION

Figure 3-1
Proposed Extraction Well
Construction Detail

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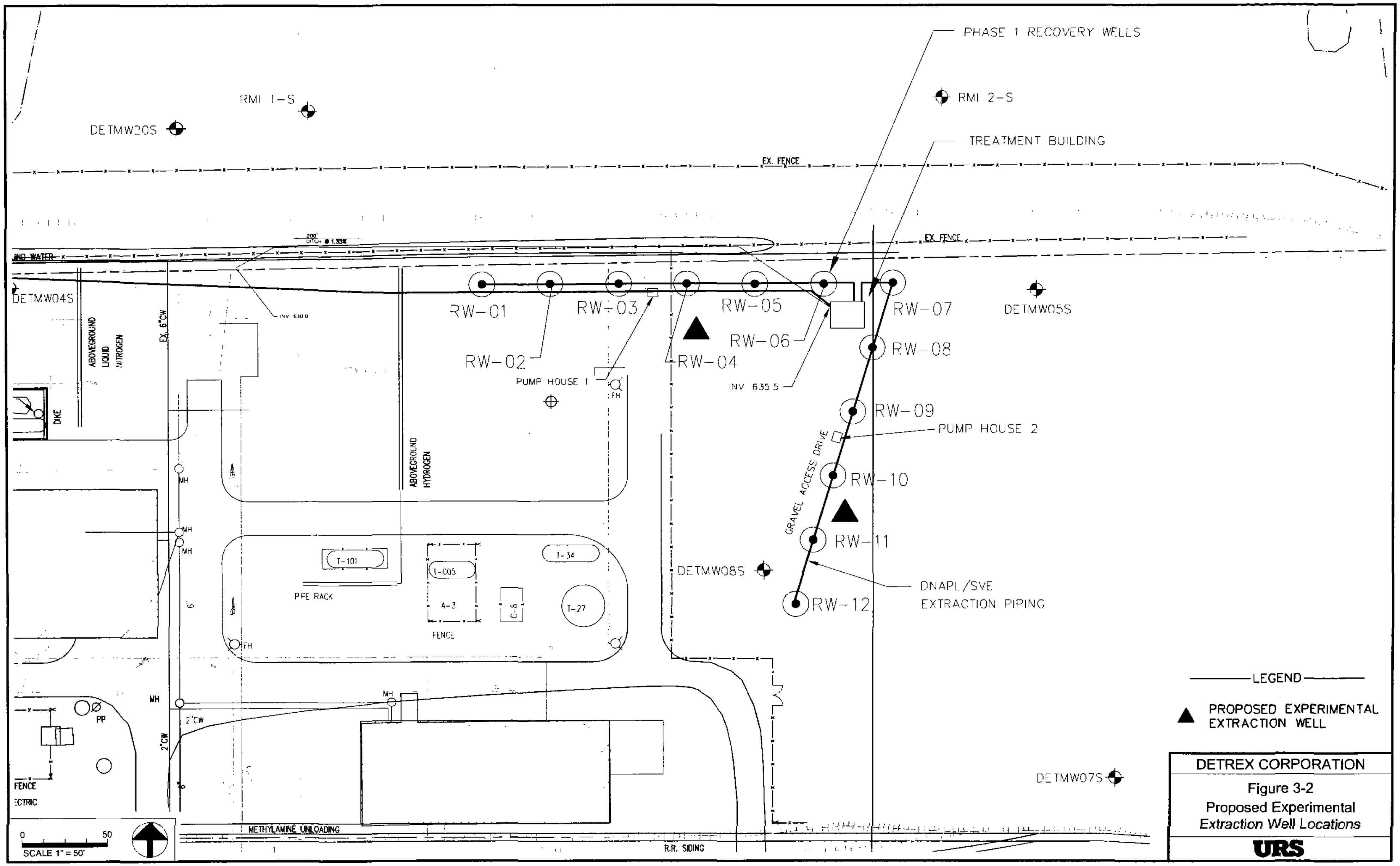


DETREX CORPORATION

Figure 3-2
Proposed Experimental
Extraction Well Locations

URS

APPENDICES

APPENDIX A
AGENCY CORRESPONDANCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

October 12, 2004

Via Certified Mail
Return Receipt Requested

SR-6J

Mr. Thomas Steib
Detrex Corporation
1100 N. State Road
Ashtabula, OH 44004

RE: U.S. EPA Technical Support Issues Concerning the Addition of Experimental Extraction Wells and Site O&M- Detrex Source Control Area - Fields Brook Superfund Site - Ashtabula, Ohio - Docket No. - V-W-98-C-450

Dear Mr. Steib:

U.S. EPA Region 5 staff and specialists from U.S. EPA's Ground Water Technical Support Center (GWTSC) in Ada, Oklahoma have reviewed Detrex's responses (dated July 15, 2004) to the comments raised in my letter of June 14, 2004. U.S. EPA is pleased that Detrex is successfully removing Dense Non-Aqueous Phase Liquid (DNAPL) from the site, but remains concerned that a thorough evaluation of design options may not have been performed in Detrex's effort to improve pump and well operations.

In Detrex's response, Detrex emphasizes the phrase "readily recoverable" as a justification for limiting attempts to upgrade the current system of extraction wells. The Source Control ROD references U.S. EPA To Be Considered (TBC) Guidance on DNAPL removal and states that the remediation objective should be to "remove free-phase, residual and vapor phase DNAPL 'to the extent practicable'". Detrex's success in removal of product demonstrates that there is a large volume of mobile DNAPL at the site and that removal is feasible. While Detrex has experienced operational difficulties with its system, the scope of the difficulties has not been out of proportion to the significance of the DNAPL being extracted at the site.

Detrex's response to the comments from U.S. EPA's GWTSC did not provide much detail to support the approach for the two planned experimental wells. Detrex's response notes that URS has evaluated the capabilities of diaphragm pumps to lift DNAPL from recovery wells. Reviewers from GWTSC have commented that there are vendors that should have pumps capable of pumping DNAPL, even if mixed with crystallized product and silt. U.S. EPA would like to understand the extent of URS's search for a workable pump and requests that Detrex provide a list of vendors and pumps considered for use at the site. From this list, U.S. EPA can gain an understanding of the diligence undertaken by URS to address the site operational difficulties. This information would also serve as a baseline for future recommendations from U.S. EPA. In addition, U.S. EPA's GWTSC recommended that new wells be constructed with an oversized filter pack. Detrex responded that URS was proposing a new sand pack construction, but did not provide well construction details so that U.S. EPA could evaluate whether the proposed construction addressed the filter pack recommendation.

Detrex should provide a detailed explanation of difficulties encountered with the site extraction wells. Previous documentation from Detrex (including but not limited to your February 9, 2004 correspondence) has stated that wells had collapsed. However, in the response to the comments from GWTSC, Detrex states that wells have not collapsed, but have filled with silt. Clear and consistent use of terminology is necessary so that all parties can understand what is happening at the site.

Detrex identifies that short-circuiting of the air pressure is a significant problem with the wells. It is unclear what has been done to remedy this problem. Detrex should evaluate possible approaches (including the installation of additional barrier material, such as a larger pad) to reduce short circuiting.

Because Detrex maintains that its design is adequate, U.S. EPA will not direct Detrex to modify the planned experimental extractions wells. Detrex should proceed with the installation of the wells this fall. However, Detrex must provide complete construction details for the wells. U.S. EPA wants a complete understanding of what is being tried at the site to better assist with recommendations for system expansion.

The draft Operation and Maintenance Manual for the Source Control and Vacuum-Enhanced Recovery System should be updated to address the following:

1. The addition of the new experimental extraction wells;
2. Clarification of wells proposed for water levels and chemical monitoring (Figure C-3 from the System Expansion proposal identifies existing and new monitoring wells);
3. Expansion of water level and chemical monitoring to document the performance of the slurry wall and recovery trenches;
4. Identification of new monitoring points to evaluate the southern and western edges of the DNAPL plume; and
5. A updated Health and Safety Plan for O&M should be prepared and submitted to U.S. EPA for review.

The information and revisions requested in this letter should be provided, along with a schedule for well installation, within 30 days of your receipt of this letter. This includes:

URS 1. An itemization of vendors and types of downhole recovery pumps considered for the new extraction wells, with explanation of why they were or were not chosen for use;

URS/D 2. A revised explanation of past operational difficulties (to resolve inconsistent use of terminology);

URS/I 3. An evaluation of approaches to minimize short-circuiting;

URS 4. Planned well construction details for new experimental extraction wells; and

? 5. A revised O&M Plan (including revised Health and Safety Plan).

As a general note, GWTSC has suggested that the extraction wells may be being pushed beyond their capacity and that DNAPL removal would likely be optimized with more extraction wells being operated less aggressively. U.S. EPA hopes that the experimental wells prove successful at DNAPL removal and provide reduced operational difficulties so that system expansion can be accomplished in a manner that results in reduced O&M costs.

If you have any questions concerning U.S. EPA comments and requirements, please do not hesitate to contact me at 312-353-6564.

Sincerely,

Terese A. Van Donsel

Terese A. Van Donsel
Remedial Project Manager

cc: T. Short / EPA-R5
P. Felitti /EPA-R5
D. Burden / EPA-GWTSC
R. Williams / OEPA
R. Currie / Detrex
Site File - Fields Brook / Detrex

Sent via E-mail
11/12/2004 12:25
By JRA

Ms. Terese A. Van Donsel
Remedial Project Manager
USEPA Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

FILE COPY

RE: Response to Comments Dated October 12, 2004
Regarding Detrex Source Control Area
Fields Brook Superfund Site
Ashtabula, Ohio – Docket No. V-W-98-C-450

Dear Ms. Teresa:

Detrex has received your letter dated October 12, 2004 regarding Technical Support issues concerning the addition of experimental extraction wells and site operations and maintenance at the above referenced site. In your letter you expressed several concerns of the US EPA Region 5. We have compiled these concerns in this correspondence. In most instances, the comments will be fully addressed in a work plan, which is currently being prepared by URS. Rather than provide detailed responses to the US EPA's specific comments at this time, it would be more time efficient for the US EPA to review the completed work plan. URS anticipates that the work plan will be available for US EPA review within 45 days of the date of this letter December 27, 2004.

1) *Comment*: Detrex was missing details to support the approach for the two planned experimental wells.

   Response: URS is currently producing a work plan to locate and install the experimental recovery wells on-site.

2) *Comment*: The USEPA requests that Detrex provide a list of vendors and pumps considered for the site.

   Response: During the Feasibility Study, URS evaluated a wide variety of recovery methods before selecting the currently approved pilot system. The current system, as designed, is capable of removing DNAPL, including the silt and crystallized product. However, the purpose of evaluating other pumps is to assess the potential for continuous operation with reduced operation and maintenance. To date, URS has looked at rotary screw pumps, electric submersible pumps, pneumatic pumps and air lift pumps.

3) *Comment*: The USEPA recommends an oversized filter pack.

   Response: URS is evaluating the use of Rotosonic drilling techniques for a higher quality well installation, the reduction in the volume of generated wastes and a reduced potential for exposure to chemicals of concern during the drilling activities. Detrex agrees that an oversized filter pack will be beneficial in particulate filtration. The increased particulate filtration and the new filter pack design may reduce the DNAPL recovery rate. These changes will be incorporated into the work plan.

4) *Comment*: Insufficient information was provided for the USEPA to evaluate the filter pack recommendation by URS.

   Response: Greater detail regarding the filter pack will be included in the work plan.

5) *Comment*: Detrex should provide a detailed explanation of difficulties encountered in the site extraction wells. Specifically, the USEPA requests a clarification as to mode of well failure since it was stated in documentation from Detrex that the wells had either collapsed or had silted up.

   Response: In September 2003, URS evaluated the status of the DNAPL recovery system and performed well redevelopment and rehabilitation activities. Several wells had accumulated several feet of silt. All wells were found to be intact. URS has since redeveloped the wells. However, the recovery wells continue to show considerable siltation and several have been taken off-line. The casing and screens have not collapsed or failed. The problems are all associated with silt intrusion.

6) *Comment*: The USEPA is requesting information as to the remedy applied for the short-circuiting of air pressure in the wells. Approaches including the installation of additional barrier material were suggested by the USPEA.

   Response: The issues related to controlling air flow will be addressed in the work plan. By utilizing a different pumping method, which will be evaluated in the experimental recovery wells, the short circuiting issue may be eliminated. Other options to reduce the short circuiting will be evaluated in the work plan and in the subsequent field activities report. Currently, Detrex has reduced air pressure to the wells, as described in the in the monthly reports.

7) *Comment*: The USEPA has indicated that Detrex must supply complete construction details for the wells.

   Response: Construction details will be provided in the work plan.

8) *Comment*: The USEPA has requested that the draft Operation and Maintenance (O&M) Manual for the Source Control and Vacuum-Enhanced Recovery System be updated to address a number of issues, specifically:

   a. *Comment*: The addition of the new experimental extraction wells.

Response: Detrex concurs. The O&M plan will be updated following the installation of the experimental wells.

b. *Comment*: Clarification of wells proposed for water levels and chemical monitoring.

   Response: In August 2004, URS installed a monitoring well (MW-21) down gradient of the slurry wall. This well will be incorporated in the monitoring plan for the site. Detrex will modify the monitoring plan to include the rationale and clarification of the wells to be monitored. The updated monitoring plan will be submitted to the USEPA within 30 days of this letter (by December 12, 2004).

c. *Comment*: Expansion of water level and chemical monitoring to document the performance of the slurry wall and recovery trenches.

   Response: The revised monitoring network will be provided in the updated O&M plan.

d. *Comment*: Identification of new monitoring points to evaluate the southern and western edges of the DNAPL plume.

   Response: The revised monitoring network will be provided in the updated O&M plan.

e. *Comment*: An updated Heath and Safety Plan for O&M should be prepared and submitted to the USEPA for review.

   Response: Detrex will perform a hazard analysis, to include the upcoming field activities and identify potential safety concerns regarding the experimental wells. The site specific health and safety will be updated to incorporate the additional safety concern.

URS is in the process of preparing the work plan to proceed with the installation of the experimental wells. The work plan will be provided to the USEPA within 45 days of this letter. Detrex anticipates that field activities will be initiated within 120 days of this letter, weather permitting, and pending additional comments from the USEPA.

If you have any comments or additional concerns, do not hesitate to contact me.

Sincerely

Thomas Steib
Detrex Corporation

cc: Keith Mast – URS Corporation

APPENDIX B
REVISIONS TO SYSTEM O&M MANUAL

December 12, 2004

Ms. Terese A. Van Donsel
Remedial Project Manager
USEPA Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

RE: Update to the Operations and Maintenance Manual
Monitoring Plan - Section 5.0
Source Control & Vacuum Enhanced DNAPL Recovery System
Detrex - Fields Brook Superfund Site
Ashtabula, Ohio – Docket No. V-W-98-C-450

Dear Ms. Teresa:

Per our November 12, 2004 response to comments letter to you, please find attached the draft modifications to Section 5.0 of the Operations and Maintenance (O&M) Manual for the referenced site. Modifications include: the clarification of wells proposed for water level and DNAPL measurements and chemical monitoring; a description of the installation of the new monitoring well DETMW-21; and the identification of additional monitoring points to evaluate the southern and western edges of the DNAPL plume. An updated Figure 5 (Groundwater Monitoring Well Locations) and the boring logs presenting the construction details for DETMW-21 are also included. Following your review, Detrex will incorporate the changes into the final O&M Manual.

If you have any comments or additional concerns, do not hesitate to contact me.

Sincerely

Thomas Steib
Detrex Corporation

cc: Keith Mast – URS Corporation

5.1 MONITORING TASKS

Monitoring will be performed to assess the effectiveness of the system. Monitoring data will also be used to demonstrate that the DNAPL plume is stable or reducing in aerial extent.

5.1.1 Slurry Wall/ Groundwater Recovery Trench/ DS Interceptor Trench

Inspections

The stormwater collection sump will be inspected quarterly for flow. Additionally, the cleanouts will be inspected quarterly for physical damage.

Monitoring

Groundwater elevations will be collected from selected monitoring wells on Detrex property and the RMI Property to the north. Monitoring wells located upgradient and downgradient of the barrier wall will be included in the monitoring network. Groundwater elevations and DNAPL thickness (if any) will be measured on a quarterly basis. Groundwater samples will be collected from selected monitoring wells located both upgradient and downgradient of the slurry wall on a semi-annual basis. Samples will be analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) via Methods SW846-8260 and SW846-8270, respectively. After five years of sampling, a review will be made of the results and the sampling program may be modified if results appear to be stable.

The locations of the monitoring wells are presented in Figure 5. In August 2004, an additional monitoring well, DETMW-21, was installed immediately downgradient of the barrier wall. The boring log for DETMW-21 is included in Appendix A of this O&M manual. The location of DETMW-21 has been included in Figure 5.

Monitoring well network

The following wells will be included in the monitoring well network for monitoring the performance of the slurry wall, groundwater recovery trench, and the DS interceptor trench:

- **Upgradient**
  - ❖ DETMW-04S
  - ❖ DETMW-20S
  - ❖ DETMW-01S
- **Downgradient**
  - ❖ DETMW-21
  - ❖ RMIMW-05S

5.1.2 Recovery System Monitoring

System Inspections

The DNAPL system will be operated during working hours. Flow totalizer and DNAPL volumes will be estimated and recorded daily and documented by Detrex personnel. System maintenance personnel will prepare maintenance and inspection reports for the DNAPL Recovery System. These reports will be archived in the project file and stored at the Detrex central file location for no less than five years.

Groundwater Monitoring

Groundwater elevations and DNAPL thickness will be measured from all the monitoring wells located within the estimated aerial extent of the DNAPL plume on a quarterly basis. Wells to be monitored include DETMW-04S, DETMW-05S, DETMW-06S, DETMW-07S, DETMW-08S, DETMW-09S, DETMW-10S, RMI-1S, and RMI-2S.

Quarterly status reports will be prepared by Detrex and submitted to USEPA. Detrex will retain these records for no less than five years.

Vapor Emissions Sampling

Vapor emissions are continuously monitored via an in line indicator. All vapors are exhausted through at least two carbon canisters that are installed in series. When the first in line indicator fails, a new container is installed as the second container in the series and the previous second container becomes the first container. This process is repeated every time the in line indicator turns color showing the activated carbon is spent.

5.1.3 DNAPL Plume Monitoring

Select wells will be monitored to evaluate the southern and western edges of the DNAPL plume. Groundwater elevations and DNAPL thickness (if any) will be measured on a quarterly basis. Groundwater samples will be collected from the selected monitoring wells located to the south and the west of the DNAPL plume on a semi-annual basis. Samples will be analyzed for volatile organic compounds (VOCs) and semi-volatile organic com+`pounds (SVOCs) via Methods SW846-8260 and SW846-8270, respectively. After five years of sampling, a review will be made of the results and the sampling program may be modified if results appear to be stable.

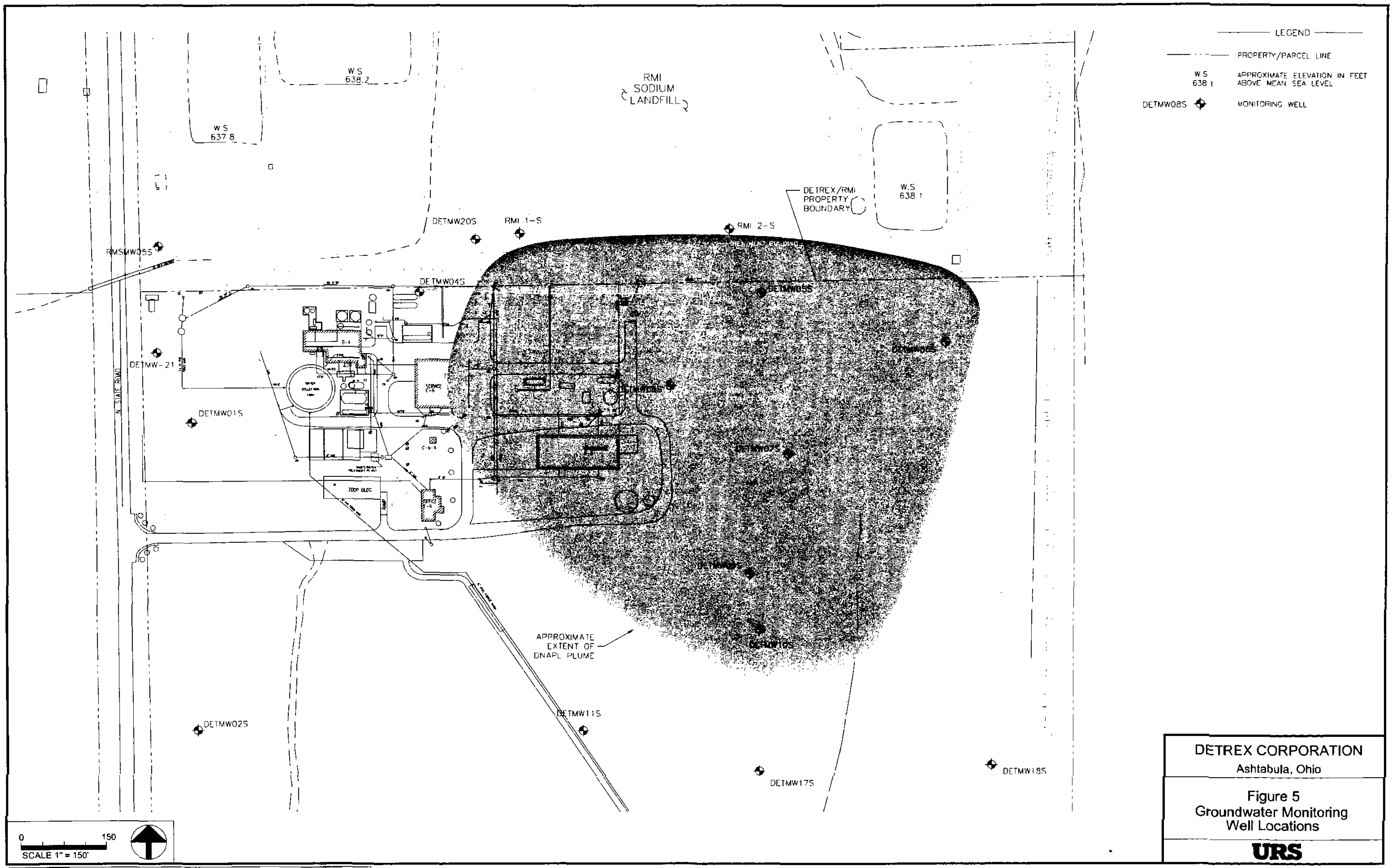
The locations of the monitoring wells are presented in Figure 5. Wells to be monitored include DETMW02S, DETMW-17S, and DETMW-18S.

5.1.4 Quality Assurance/Quality Control Procedures

Samples for QA/QC will include the following:

- One duplicate sample will be submitted for analysis with each round of semi-annual groundwater samples. One laboratory-prepared trip blank and one laboratory-prepared temperature blank will accompany each sample shipping container.

- All samples will be shipped or delivered to an approved laboratory using appropriate chain-of-custody protocol to assure proper handling of samples.
- Following receipt of data, the information will be reviewed to verify that samples were analyzed within the required holding times, the analyses met the required detection limits, and all spikes and duplicate samples were within acceptable ranges.



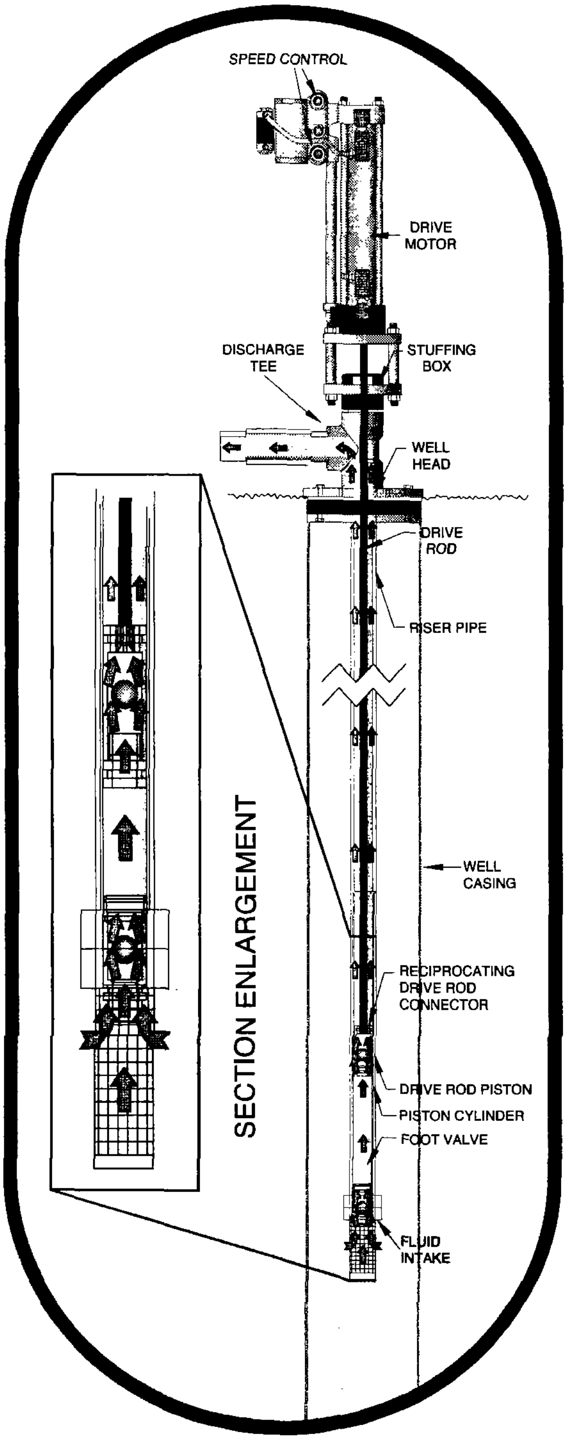
DETREX CORPORATION
Ashtabula, Ohio

Figure 5
Groundwater Monitoring
Well Locations

URS

APPENDIX C
PROPOSED PUMP SPECIFICATIONS

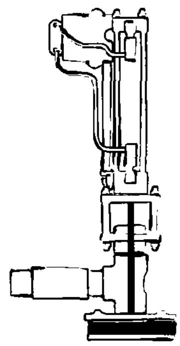
Trident Pump Model DT01



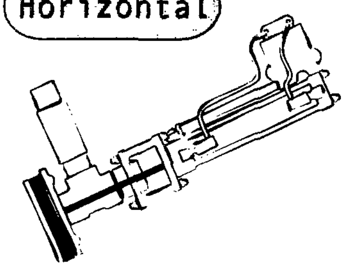
APPLICATIONS:

- Petro-Chemical Fluids
- Remediation Oil, Tar, Gases
- Hazardous/Potentially Hazardous Fluids
- Gas Condensate

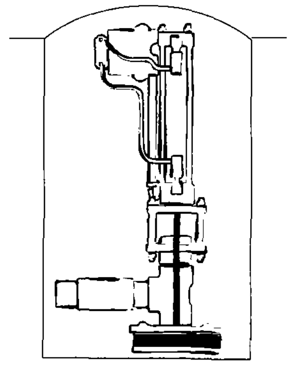
Vertical



Horizontal



Vault



BLACKHAWK COMPANY • 21W161 HILL AVE., GLEN ELLYN, IL 60137
PHONE: 630.469.4916 • FAX: 630.469.4896
www.blackhawkco.com

TPMS207

Trident Pump Model DT01

The powerful Trident Pump is a pneumatically driven, positive displacement piston pump with a top head drive and flow range of 0-10 gpm. Designed for difficult, hazardous, explosive, and/or chemically challenging pumping applications, the Trident Pump can pump against high head pressure and at great depths.

Features	Benefits
Top Head Drive Motor	• Drive motor is on top of well or sump. • Generates up to 380 PSI of power equivalent to 880' TDH. • Heavy duty compact driver fits into enclosed vault. • Down hole environment (e.g. temperature, corrosion, pressure, vacuum, etc.) does not affect pump performance. • Air system shutdown does not impact pump.
Controlled Pumping	• Controls drawdown of liquid. • Matches pumping rate to yield of product in well or tank. • Increases well life. • Gently handles product, without emulsification. • Measured metered flow.
Air Lines Outside Of Well	• Compressed air is not in well or sump. • Compressed air does not contact liquid being pumped. • Biological or encrustation build up is reduced or eliminated. • Foamy liquid discharge is reduced.
Best Drawdown Capability In Industry	• Draws liquid to bottom intake, independent of liquid head. • Pump does not need to be submersed to operate. • Pump operates vertically or horizontally. • Pumps thick, heavy, viscous liquids.
Safe, Clean, Healthy Operation	• Top head drive feature keeps operator free from contaminates. • Inspection and maintenance are healthy and safe. • Pump discharge exhaust air is free of contaminants.

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TPMS207

SPECIFICATIONS FOR THE TRIDENT PUMP MODEL DT-01

The pumping system shall be powered by compressed air. The control motor shall be located at surface grade. The pump will be capable of removing water and product(e.g. oil, solvents, leachate) from a well casing of two (2) inch*(4.85 cm)* diameter or greater to depths of 1,070 feet*(326 meters)*. The fluid inlet shall be located at the bottom of the pump intake cylinder and be capable of removing water or product to 0 submergence depth.

PUMP
The pump has the pump motor and controls at surface grade. There shall be no timers, bubblers or air valves external to the pump needed to operate the pump. The pump shall not introduce any air or air lines into the well. The pump shall be powered from grade by a fiberglass sucker-rod assembly. Product shall be discharged through the 1 1/4"*(3.18 cm)* eductor pipe. The sucker-rod and pump assembly shall be capable of being removed through the open throat of the 1 1/4"*(3.18 cm)* eductor pipe at grade for easy field service.

The pump shall be able to pump 3 gpm*(11.3 lpm)* using 35 psi*(2.46 kg/sq cm)* at 0 submergence to a depth of 200 feet*(61 meters)*. Industrial quality air pressure can be used to power the pump motor. Power to the pump shall be direct from grade through the sucker-rod assembly.

Standard materials of construction shall be stainless steel, Viton, Delrin, fiberglass, and PVC

PUMP MOTOR DESCRIPTION
1. The pump motor shall be located at grade on top of the well head assembly.
2. The pump air motor assembly shall need one hose - air input.
3. The pump shall be able to function with inlet air pressures ranging from 20*(1.41 kg/sq cm)* to 120 psi*(8.44 kg/sq cm)*.
4. The pump air cylinder motor shall exhaust air.
5. No air or air lines shall be introduced down the well.
6. No air shall come in contact with the liquid to be pumped.

PUMP INTERNALS
1. The fluid discharge pipe(eductor pipe) of the pump can be PVC, HDPE, or steel.
2. The discharge pipe of the pump shall serve as the tension member between the top and bottom of the pump.
3. The sucker-rod assembly shall be fiberglass, stainless steel, and viton.
4. The pump shall supply a volume of .05 gallons per stroke*(0.19 liters per stroke)* at 0 submergence head and 20 psi*(1.41 kg/sq cm)* air supply.

PUMP ASSEMBLY
1. The pump cylinder shall be stainless steel and 30" x 1 1/4"*(76.20cm x 3.18cm)*.
2. The bottom foot valve and sucker-rod piston valve shall be interchangeable for easy service.
3. The foot valve and sucker-rod piston valve shall be a free floating, self cleaning, ball check valve.

FLOW RATE
The pump shall be able to remove at 3 gpm*(11.3 lpm)* with 35 psi*(2.46 kg/sq cm)* air supply at 0 inlet submergence at 200 feet*(61 meters)* of depth.

COMPRESSED AIR FILTER/REGULATOR
The air filter shall filter the air to 5 microns and be able to remove some oil and water from compressed air. The regulator shall be able to regulate the compressed air from 0 to 125 psi*(8.79 kg/sq cm)*.

TRIDENT PUMP

A simple pump for difficult applications

The Blackhawk Trident Pump uses a stainless steel cylinder, self cleaning check-ball assemblies, and a fiberglass sucker-rod assembly. These three parts are the basic components of the Trident Pump.

The pump is made to be a simple pump for difficult applications.

The pump head assembly is situated above the well. It is connected to the cylinder by means of the riser pipe. The up and down stroke movement of the fiberglass sucker-rod assembly is transmitted down the riser pipe to the check ball piston which presses the water in the riser pipe up to the surface.

A foot valve is incorporated into the cylinder. Fabricated stainless steel components ensure high reliability, efficiency, and long trouble free life.

The Trident Pump has been field tested in the most difficult environmental and landfill recovery wells through winter and summer seasons.

The Trident Pump is easy to install and is designed for in field service.

The Blackhawk Environmental Company offers an optional service which includes field training of customer personnel for installation maintenance and repair.

TECHNICAL DATA

Stroke length	12"*(30.48 cm)*
Maximum external diameter	1.9"*(4.85 cm)*
Total cylinder length	30"*(76.2 cm)*
Connection of riser pipe	1 1/4"*(3.18 cm)*
Connection to sucker rod	7/16" - 20
Recommended internal diameter of bore hole	2 - 3"*(4.85 cm - 7.62 cm)* or greater diameter
Weight of cylinder	8 Lbs.*(3.63 kg)*

PERFORMANCE [When using Blackhawk Environmental Company motor]

Operational depth.	1,070'*(326 meters)* Maximum
Stroke length	12"*(30.48 cm)*
Strokes per minute	5 - 60
Discharge per stroke*	.05 gal. per stroke*(.19 liters per stroke)*

*Note flow does not vary with depth.

MATERIALS

The Blackhawk Trident Pump is manufactured from stainless steel, Viton, Delrin, fiberglass, and PVC

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The pumping system shall be powered by compressed air. The control motor shall be located at surface grade. The pump will be capable of removing water and product(e.g. oil, solvents, leachate) from a well casing of two (2) inch*(4.85 cm)* diameter or greater to depths of 1,070 feet*(326 meters)*. The fluid inlet shall be located at the bottom of the pump intake cylinder and be capable of removing water or product to 0 submergence depth.

PUMP
The pump has the pump motor and controls at surface grade. There shall be no timers, bubblers or air valves external to the pump needed to operate the pump. The pump shall not introduce any air or air lines into the well. The pump shall be powered from grade by a fiberglass sucker-rod assembly. Product shall be discharged through the 1 1/4"*(3.18 cm)* eductor pipe. The sucker-rod and pump assembly shall be capable of being removed through the open throat of the 1 1/4"*(3.18 cm)* eductor pipe at grade for easy field service.

The pump shall be able to pump 3 gpm*(11.3 lpm)* using 35 psi*(2.46 kg/sq cm)* at 0 submergence to a depth of 200 feet*(61 meters)*. Industrial quality air pressure can be used to power the pump motor. Power to the pump shall be direct from grade through the sucker-rod assembly.

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*Note flow does not vary with depth.

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